Niagara Mohawk

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October 22, 2001
NMP1L 1619

United States Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

RE: Nine Mile Point Unit 1
Docket No. 50-220
DPR-63

Subject: ***"Reactor Scram Due to Failure of Generator Protective Relay"***

Gentlemen:

In accordance with 10 CFR 50.73 (a)(2)(iv)(A) we are submitting Licensee Event Report 01-001, "Reactor Scram Due to Failure of Generator Protective Relay."

Very truly yours,

John T. Conway
Vice President Nuclear Generation

JTC/KLE/cld
Attachment

cc: Mr. H. J. Miller, NRC Regional Administrator, Region I
Mr. G. K. Hunegs, NRC Senior Resident Inspector
Records Management

IE22

NRC FORM 366 (1-2001) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004

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LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Nine Mile Point, Unit 1	05000220	1 OF 4

TITLE (4)

Reactor Scram Due to Failure of Generator Protective Relay

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
08	22	2001	2001	— 001 —	00	10	22	2001	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)			
1	20.2201(b)	20.2203(a)(3)(ii)	50.73(a)(2)(ii)(B)	50.73(a)(2)(ix)(A)
POWER LEVEL (10)	20.2201(d)	20.2203(a)(4)	50.73(a)(2)(iii)	50.73(a)(2)(x)
100	20.2203(a)(1)	50.36(c)(1)(i)(A)	X 50.73(a)(2)(iv)(A)	73.71(a)(4)
	20.2203(a)(2)(i)	50.36(c)(1)(ii)(A)	50.73(a)(2)(v)(A)	73.71(a)(5)
	20.2203(a)(2)(ii)	50.36(c)(2)	50.73(a)(2)(v)(B)	OTHER
	20.2203(a)(2)(iii)	50.46(a)(3)(ii)	50.73(a)(2)(v)(C)	
	20.2203(a)(2)(iv)	50.73(a)(2)(i)(A)	50.73(a)(2)(v)(D)	
	20.2203(a)(2)(v)	50.73(a)(2)(i)(B)	50.73(a)(2)(vii)	
	20.2203(a)(2)(vi)	50.73(a)(2)(i)(C)	50.73(a)(2)(viii)(A)	
	20.2203(a)(3)(i)	50.73(a)(2)(ii)(A)	50.73(a)(2)(viii)(B)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
P. Mazzaferro, Manager, Technical Support	315-349-1019

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
X	EL	46	GE	Y					

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).	X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On August 22, 2001 at 0508 hours, Nine Mile Point Unit 1 experienced an unplanned scram due to a generator trip from approximately 100 percent power. The reactor was operating at steady state conditions prior to the scram. The immediate cause for the generator trip was actuation of the Negative Phase Sequence Current Relay in response to a grid perturbation. All control rods fully inserted. In response to the generator trip, reactor pressure rose to 1115 pounds per square inch gage (psig). The increase in pressure resulted in all six Electromatic Relief Valves (ERVs) opening briefly, as designed. Approximately 37 seconds post scram the Main Steam Isolation Valves (MSIVs) automatically closed due to the mode switch being in RUN and reactor pressure at 850 psig. Approximately six minutes after closing, the MSIVs were re-opened.

The cause of the generator trip was a grid perturbation coupled with a malfunction of the Negative Phase Sequence Current Relay. The relay malfunction was due to a design flaw. A contributing cause was failure to utilize previous external operating experience. The MSIV closure was caused by lack of specific direction regarding when the mode switch should be taken to SHUTDOWN post scram.

Corrective actions included replacing the relay with one of a new design and briefing the operating crews of the management expectation that the first immediate action after a scram is to place the mode switch in SHUTDOWN. Preventive action will involve reviewing General Electric Operating Experience not previously evaluated.

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NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* (17)

I. Description of Event

On August 22, 2001 at 0508 hours, Nine Mile Point Unit 1 experienced an unplanned scram, from approximately 100 percent power, due to a generator trip. The reactor was operating at steady state conditions prior to the scram. The immediate cause for the generator trip was actuation of the Negative Phase Sequence Current Relay generator protection logic in response to a grid perturbation. All control rods fully inserted. In response to the generator trip, reactor pressure rose to 1115 pounds per square inch gage (psig). The increase in pressure resulted in all six Electromatic Relief Valves (ERVs) opening, as designed. The ERVs closed within four seconds of the scram. Feedwater control transferred to the High Pressure Coolant Injection mode upon receipt of the turbine trip signal as designed. Approximately 37 seconds post scram, the Main Steam Isolation Valves (MSIVs) automatically closed. The MSIVs receive a close signal when the mode switch is in RUN and reactor pressure lowers to 850 psig. During the event, operators were performing post scram reporting and did not reposition the reactor mode switch from RUN to SHUTDOWN prior to reactor pressure reaching 850 psig. The scram reporting involves communicating the status of the reactor parameters, including control rod position, to the Control Room Supervisor. Minimum pressure reached was approximately 815 psig. The maximum pressure reached while the MSIVs were closed was approximately 920 psig. Approximately six minutes after closing, the MSIVs were re-opened, following an evaluation of plant conditions.

Post scram, reactor water level reached a minimum level of 30 inches. The feedwater flow control valves functioned as designed and recovered reactor water level. Reactor water level reached 90 inches approximately one minute after the scram. At 90 inches all feedwater flow control valves were closed. Heatup of the water injected post scram resulted in reactor water level increasing to approximately 106 inches. Feedwater pumps 11 and 12 tripped as designed when reactor water level exceeded 95 inches. The high reactor water level resulted in water level partially covering the Emergency Condenser (EC) nozzles. Water entry into the EC lines had been previously analyzed and the ECs remained operable. Water level remained below the level at which water entry into the Main Steam Lines would occur.

An evaluation post scram concluded that the cause of the trip was a generator load rejection caused by the actuation of the Negative Phase Sequence Current Relay. A review of fault recordings indicated that a fault occurred on the 345 kilovolt (KV) grid outside the station, which was detected by the Negative Phase Sequence Current Relay. The fault event lasted only four cycles, approximately 64 milliseconds. However, the Negative Phase Sequence Current Relay has a time delay which should have prevented the relay from actuating.

The Negative Phase Sequence Current Relay is a General Electric (GE) 12SGC21A1A relay. The relay is designed to protect the generator against possible damage from unbalanced currents resulting from prolonged faults or unbalanced-load conditions. When actuated, the relay causes a generator load rejection that would be followed by a turbine trip.

A review of operating experience identified a similar event at Palo Verde in 1992 and identified GE Service Advisory Letter (SAL) 189.1 as applicable to the Nine Mile Point Unit 1 event. GE SAL 189.1, issued in 1987, documented a design flaw in the time delay circuitry of relay 12SGC21A1A that could occasionally result in an almost instantaneous actuation. A review of records indicates that Nine Mile Point Unit 1 had not previously evaluated this GE SAL or the Palo Verde event.

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NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* (17)

II. Cause of Event

The reactor scram was caused by a generator load reject. The faulty design of the Negative Phase Sequence Current Relay caused the generator load reject. The relay has a time delay that should have prevented actuation, given the length of time the grid perturbation was present. However, a design flaw in the relay can result in the time delay becoming nearly instantaneous. This design flaw is documented in GE SAL 189.1.

A contributing cause is a failure to use operating experience. In 1987, GE issued SAL 189.1 documenting a design flaw in the time delay circuitry of relay 12SGC21A1A. In 1992 a similar event occurred at Palo Verde. A review of records indicates that Nine Mile Point Unit 1 had not previously evaluated this GE SAL or the Palo Verde event.

The MSIV closure was caused by unclear standards regarding when to reposition the mode switch to SHUTDOWN post scram. Interviews with operating crews identified that repositioning the mode switch post scram was not consistent among the crews. Some crews reposition the mode switch to SHUTDOWN prior to providing a scram report to the Control Room Supervisor while other crews provided the scram report prior to repositioning the mode switch.

III. Analysis of Event

The reactor scram and automatic closure of the MSIVs are reportable in accordance with 10 CFR 50.73(a)(2)(iv)(A), "Any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B)...." Paragraph (a)(2)(iv)(B) lists actuation of the reactor protection system including reactor scram and containment isolation signals affecting multiple main steam isolation valves.

During this event, all plant safety systems operated as designed. The ERVs opened consistent with the analysis of a load rejection with a scram as described in the Final Safety Analysis Report (Updated). Additionally, no Emergency Core Cooling Systems actuated or should have actuated during the event.

Although the MSIVs closed during the event they were re-opened within six minutes. During the time that the MSIVs were shut reactor pressure reached a maximum of 920 psig. No ERV set points were reached, and the condenser remained available.

Post scram the feedwater system functioned as designed. Heatup of water injected post scram contributed to high reactor water level which resulted in water level partially covering the EC nozzles and the tripping of feedwater pumps 11 and 12. Water entry into the EC lines had been previously analyzed and the ECs remained operable. Reactor water level remained below the level at which water entry into the Main Steam Lines would occur. Feedwater pumps 11 and 12 were available for restart upon resetting the high level trip and would have automatically restarted if reactor water level had reached 53 inches.

A Probabilistic Risk Assessment (PRA) evaluation of the event concluded that the estimated Conditional Core Damage Probability (CCDP) was 5.68 E-7 and therefore the event was not risk significant.

Based on the above, the event did not pose a threat to the health and safety of plant personnel or the public.

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NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)* (17)

IV. Corrective Actions

1. The Negative Phase Sequence Current Relay was replaced with a GE relay of a new design.
2. Nine Mile Point will conduct an operating experience review of GE SALs not previously evaluated.
3. The Operations Manual was modified such that the scram report is provided after the mode switch is placed in SHUTDOWN.
4. Operations crews were briefed that the management expectation is that the first immediate action post scram is to place the mode switch in SHUTDOWN.

V. Additional Information

A. Failed Components
General Electric (GE) 12SGC21A1A relay

B. Previous similar events:
A review of Nine Mile Point Unit 1 Licensee Event Reports (LER) from 1995 to the present did not reveal events with a similar cause, faulty relay design. LER 95-02, "Reactor Scram Caused by Failure of Generator Protective Relay" and LER 96-11, "Reactor Scram Caused by the Main Generator Lockout Relay Trip" describe similar events, i.e. generator initiated scrams. The cause identified in LER 96-11 is failure of a flexible link in the generator exciter. The cause identified in LER 95-02 is failure of an oil filled capacitor in the loss of excitation relay. The corrective actions from the previous LERs would not have prevented this event.

C. Identification of components referred to in this Licensee Event Report

Components	IEEE 805 System ID	IEEE 803A Function
Emergency Condenser	BL	N/A
Feedwater System	SJ	N/A
High Pressure Coolant Injection	BJ	N/A
Main Steam	SB	N/A
Main Generator	TB	N/A
Main Generator Output Power System	EL	N/A
Main Turbine	TA	N/A
Control Rod Drive System	AA	N/A
Valve	SB	ISV
Pump	SJ	P
Control Rod	AA	ROD
Relay	EL, TB	46, 40
Nozzle	BL	NZL
Capacitor	EL	CAP
Exciter	TB	EXC
Link	TB	N/A